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Health and Safety Research Division

**RESULTS OF THE MOBILE GAMMA SCANNING ACTIVITIES
IN BERKELEY, BRIDGETON, AND HAZELWOOD, MISSOURI**

June 1985

Work performed as part of the
RADIOLOGICAL SURVEY ACTIVITIES PROGRAM

OAK RIDGE NATIONAL LABORATORY
Oak Ridge, Tennessee 37831
operated by
MARTIN MARIETTA ENERGY SYSTEMS, INC.
for the
U.S. DEPARTMENT OF ENERGY
under Contract No. DE-AC05-84OR21400

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RESULTS OF THE MOBILE GAMMA SCANNING ACTIVITIES, IN BERKELEY, BRIDGETON, AND HAZELWOOD, MISSOURI

INTRODUCTION

A mobile gamma scanning survey of the Hazelwood, Missouri area, including parts of Berkeley and Bridgeton, was conducted during the period of December 14-15, 1984. The purpose of this survey was to identify all detectable gamma radiation anomalies which may be associated with the transportation routes to and from the former Cotter Chemical Plant, located on Latty Avenue, to the West Lake Landfill located in Bridgeton, Missouri.

By memorandum from the U.S. Department of Energy (DOE)¹, it was requested that Oak Ridge National Laboratory (ORNL) perform a mobile survey of the Latty Avenue area. This report summarizes the results of the mobile survey and provides a listing of those areas with radiation anomalies. Also, a short description of the land use and any observed characteristics which may have influenced the response of the scanning van's detector system is included.

SURVEY METHODS

The following is a brief description of the scanning methods utilized for the mobile scanning of the Hazelwood area. Details of the system description and operation have been provided in Reference 2.

Instrumentation

The gamma radiation detection system employed in the ORNL scanning van consists of three 4 x 4 x 16-in. NaI(Tl) log crystals housed in a lead-shielded steel frame to provide a 12 x 16-in. detector surface area for acceptance of gamma radiation through one side of the survey van. The detector and shield height can be varied with a hydraulic lift mechanism to optimize the detector field-of-view. The detector output is transferred to a computer-controlled eight-channel discriminator and

* The survey was performed by members of the Radiological Survey Activities Group of the Health and Safety Research Division at Oak Ridge National Laboratory under DOE contract DE-AC05-84OR21400.

interface, which provides for continuous analysis of data inputs for correlation of system location with count rate information. Six separate energy regions-of-interest are analyzed and a ^{226}Ra -specific algorithm is employed to identify locations containing residual radium- and thorium-bearing materials. Multichannel analysis capabilities are included in the system for additional qualitative radionuclide identification.

Mobile Scanning Method

The data analysis method employed on the ORNL van is based on computations involving background count rates in specific energy regions. These background levels are normally obtained within small (10 square block) survey areas, based on coverage of at least 75% of the accessible streets in that area. Subsequent street-by-street scans of these areas are conducted at a slow speed (<5 mph), minimizing the distance between the detectors and the subject properties. All accessible streets, alleyways, and other public thoroughfares are scanned in both directions to maximize the number of views obtained for each property. Anomaly locations are highlighted by the computer system when the preset hit criteria are exceeded during the scan.

SURVEY RESULTS

Scope of Activities

The survey results presented in this report represent the scanning of selected streets, alleys, and thoroughfares in Berkeley, Bridgeton, and Hazelwood, Missouri.

Scan Results

As the basis for the mobile scan results, background count rates in the regions of interest were measured in each city, Berkeley, Bridgeton, and Hazelwood, Missouri. Background count rates varied only slightly from city to city. Selected roads were surveyed in each city which were suspected as being possible transportation routes for radioactive materials. The range of background values used is as follows:

	Berkeley	Bridgeton	Hazelwood
Average total Ra count rate (cps)	163 \pm 13	149 \pm 12	141 \pm 12
Average Th count rate (cps)	15 \pm 4	12 \pm 3	11 \pm 3
Average Ra/Th ratio	11 \pm 2	12 \pm 3	12 \pm 3
Hit criterion for total Ra (cps)	253	240	230
Ra/Th ratio used for hit criteria	15	18	18
Low ratio hit criteria	7	6	6

This narrow range indicates the background levels in the vicinity of Latty Avenue are relatively constant. The higher Ra/Th ratio is used for hits associated with radium anomalies, and the low Ra/Th ratio is used for hits associated with thorium anomalies. Analysis of the mobile scan data for these transportation routes only indicated ^{226}Ra anomalies. To simplify the results, the data in this report is given on a street by street basis rather than a city basis. The location and description of these areas are presented in Table 1.

No anomalies were detected from the intersection of Pershall Road and Lindbergh Boulevard, Lindbergh Boulevard to Natural Bridge Road (Highway 115), and Natural Bridge Road to St. Charles Rock Road to the West Lake Landfill entrance. Also, no anomalies were detected on North Hanley from I-270 to Airport Road, Airport Road, Frost Avenue, and Eva Avenue.

Anomalies were detected on McDonnell Boulevard, south side, from Coldwater Creek to the intersection of Norfolk and Western Railroad Crossing and on the north side of McDonnell Boulevard from the Berkeley city limits to Trumbull Asphalt sign near Byassee Road. Anomalies were detected along Pershall Road, south side, from the Ford Motor Company, new car parking area, to just past Polson Lane and on the north side of Pershall Road, opposite 8920, across Coldwater Creek for approximately 1000 feet.

Anomalies were also detected on Hazelwood Boulevard, mainly on the west side of the street, in front of Wetterau Perishable Center approximately 115 feet south from the railroad crossing to Latty Avenue and one spot on the west side of Hazelwood Blvd. approximately 200 feet south from the railroad crossing.

SIGNIFICANCE OF FINDINGS

Based on the results of the ORNL scanning activities, three areas are recommended for future on-site surveys. These areas are listed in Table 1. Although onsite surveys have been conducted at the St. Louis Airport Storage Site, anomalies were detected along McDonnell Blvd. west from Coldwater Creek to Trumbull Asphalt. It is not known at the time of this report if this area has already been characterized. The anomalies found along Pershall Road seem to be centralized around Coldwater Creek which may be associated with flooding and/or transportation of material from Latty Avenue. The anomalies along Hazelwood Blvd. were only detected in front of Wetterau Perishable Center south to Latty Avenue.

REFERENCES

1. Memorandum from Arthur J. Whitman, Division of Remedial Action Projects, U.S. Department of Energy, to William Bibb, Oak Ridge Operations Office (DOE), August 1, 1984.
2. Myrick, T. E., M. S. Blair, R. W. Doane, and W. A. Goldsmith, A Mobile Gamma-Ray Scanning System for Detecting Radiation Anomalies Associated with Ra-226 Bearing Materials, Oak Ridge National Laboratory, ORNL/TM-8475, November 1982.

Table 1. Listing of Hazelwood, Missouri area properties recommended for further investigation.

Property location	Type Anomaly	Property description
McDonnell Blvd., north side, from Coldwater Creek to Trumbull Asphalt	Ra-226	Vacant - wooded area
Pershall Road, south side, from Ford Motor Company to Polson Lane, north side, opposite Sears, 8920 Pershall Road	Ra-226	Industrial property
Hazelwood Blvd., west side at Wetterau Perishable Center; east side, approximately 200 feet south from railroad crossing	Ra-226	Industrial property

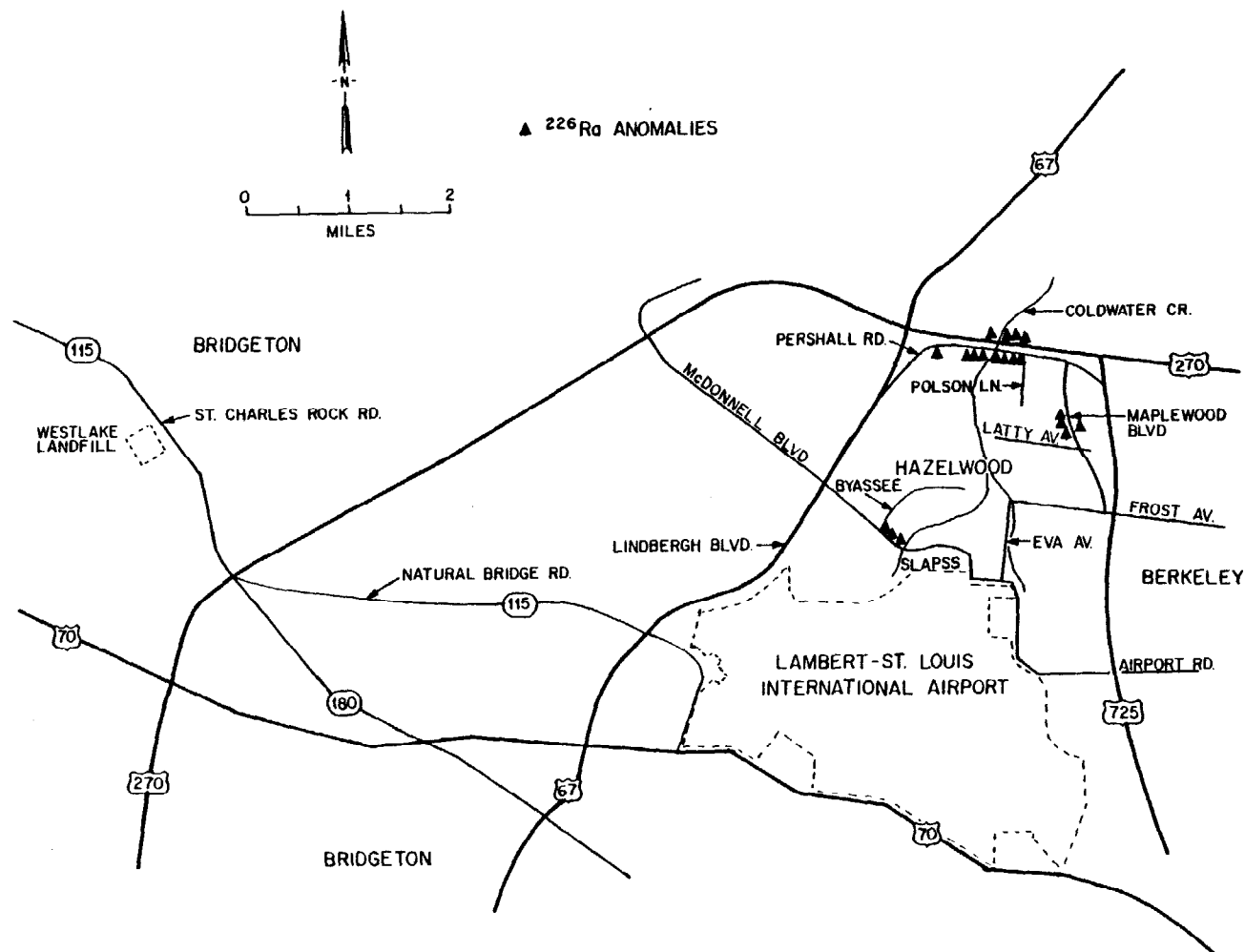


Fig. 1. Area surveyed during the mobile gamma scan of Berkeley, Bridgeton, and Hazelwood, Missouri.